Do walking and leisure-time physical activity protect against arthritis in older women?

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ABSTRACT

Objective: To examine the prospective dose–response relationships between both leisure-time physical activity (LTPA) and walking with self-reported arthritis in older women.

Design, setting and participants: Data came from women aged 73–78 years who completed mailed surveys in 1999, 2002 and 2005 for the Australian Longitudinal Study on Women's Health. Women reported their weekly minutes of walking and moderate to vigorous physical activities. They also reported on whether they had been diagnosed with, or treated for, arthritis since the previous survey. General estimating equation analyses were performed to examine the longitudinal relationship between LTPA and arthritis and, for women who reported walking as their only physical activity, the longitudinal relationship between walking and arthritis. Women who reported arthritis or a limited ability to walk in 1999 were excluded, resulting in data from 3613 women eligible for inclusion in these analyses.

Main results: ORs for self-reported arthritis were lowest for women who reported ''moderate'' levels of LTPA (OR 0.78; 95% CI 0.67 to 0.92), equivalent to 75 to <150 minutes of moderate-intensity LTPA per week. Slightly higher odds ratios were found for women who reported ''high'' (OR 0.81; 95% CI 0.69 to 0.95) or ''very high'' (OR 0.84; 95% CI 0.72 to 0.98) LTPA levels, indicating no further benefit from increased activity. For women whose only activity was walking, an inverse dose–response relationship between walking and arthritis was seen.

Conclusions: The results support an inverse association between both LTPA and walking with self-reported arthritis over 6 years in older women who are able to walk.

Arthritis is a leading cause of chronic pain and disability in Australia[1] with 19.9% of women and 17.1% of men reporting medically diagnosed arthritis in 2004.[2] In 2007, the healthcare costs directly attributable to arthritis were estimated to be $4.2 billion, a 42% increase in just 3 years.[2] The incidence and prevalence of self-reported arthritis increase with age and are greater in women, so that, by age 65–74, 61.2% of women and 48.5% of men report arthritis.[2] After age 75, the prevalence drops to 49.3% for women but remains almost unchanged for men (48.1%).[2] The prevalence of self-reported arthritis is expected to increase to 25% of women and 23% of men by 2050, in part due to increases in the elderly population.[2]

Physical activity is a potentially modifiable risk factor for arthritis. However, the few population-based studies of the prospective association between leisure-time physical activity (LTPA) and arthritis in women have shown conflicting results. Most measured osteoarthritis (OA) as the outcome. Two studies have shown beneficial effects. A US study reported low and moderate-to-high joint stress LTPA was protective against self-reported OA in women,[3] and a UK study found walking, but not sport, was protective of joint space narrowing in mid-age women.[4] In contrast, a recent Australian study found physical activity increased the risk of radiological knee OA (increased patello-femoral narrowing) but not hip OA.[5] Likewise, a long-running US cohort study found physical activity increased the risk of radiographic OA in women over 8 years but not over 20–40 years of follow-up.[6] Other US cohort studies have found no association between LTPA and self-reported arthritis.[7 8] Studies with athletes, mostly male, have found an increased risk of arthritis among some competitive elite athletes.[9–12]

The association between LTPA and arthritis in women is therefore unclear. The primary aim of this study was to explore the prospective association between LTPA and self-reported diagnosis of, or treatment for, arthritis in a population-based cohort of older Australian women. Given the popularity of walking among women,[13] a secondary aim was to explore the prospective association between walking and self-reported arthritis among women whose only physical activity was walking.

METHODS

Australian Longitudinal Study on Women's Health

The Australian Longitudinal Study on Women's Health (ALSWH) is a prospective cohort study of the health and well-being of Australian women. As reported elsewhere, stratified random samples of women aged 18–23 years (young), 45–50 years (mid-age), and 70–75 years (older) were drawn from the national health insurance database in 1996.[14 15] Women from rural and remote areas were systematically oversampled.[15] Since baseline, surveys have been administered to each cohort every 3 years on a rolling basis. Written informed consent was obtained from all participants, and the study protocol was approved by the University of Newcastle Ethics Committee. Study details are available on the study's website.[14]

Study sample

For these analyses, only data from the older women were used because data on arthritis were not available from the other women. In 1996, 12 432 older women completed the first survey. They were representative of Australian women in their age range (70–75 years) except for over-representation of women with a tertiary education

and married women.[15] Attrition between the 1996 survey and the 1999 survey (baseline for this study) was 16%. Of women lost to follow-up, the primary reasons were withdrawal (29%), death (26%), non-return (24%) and inability to re-contact (15%).[16] Women lost to follow-up were more likely to report poorer health, less education, birth in a non-English-speaking country and being smokers in 1996.[16]

Participants

The analysis sample included data collected in 1999, 2002 and 2005. These time points were chosen because the outcome and predictor variables were measured similarly at these three times. Women who reported arthritis in 1999 were excluded so that the association between LTPA and future cases of self-reported diagnosis of, or treatment for, arthritis could be assessed. Additionally, women with limited ability in 1999 to do LTPA (ie, those who reported that their health limited their ability to walk 100 metres) were excluded.

Assessment of self-reported arthritis

Arthritis was assessed in 1999 and 2002 by asking, ''In the last 3 years, have you been diagnosed with or treated for arthritis (including osteoarthritis, rheumatoid arthritis)?''[17] In 2005, the same question was asked separately for osteoarthritis, rheumatoid arthritis and other arthritis, as asked in the Australia National Health Survey.[2] Given the inaccuracy in self-reporting arthritis type, more items on types of arthritis were not provided,[18] so any of the over 100 types of arthritis could be reported. To be considered a case in 2002 or 2005, women had to answer ''no'' to the 1999 arthritis item and ''yes'' to the item in the respective year. An answer of ''no'' in 2005 after an answer of ''yes'' in 2002 was treated as missing. Although the arthritis items have not been validated against objective measures, reporting stiff or painful joints ''often'' in 2002 was associated with reporting arthritis in the older ALSWH women in 2005 (odds ratio (OR) 5.28, 95% confidence interval (CI) 4.23 to 6.61).[19] In 2005, 60% of women who reported ''pain, aching, stiffness or swelling in or around a joint or joints which were not related to an injury and lasted for more than a month'' or ''stiffness in the joint in the morning after getting up from bed, or after a long rest of the joint without movement'' also reported arthritis, whereas 80% of those who said ''no'' to these items also reported no arthritis (R Gibson, unpublished data, 2007).

Assessment of physical activity and walking

LTPA and walking were measured using the Active Australia questions, which have been validated and found to be reliable.[20 21] Women reported frequency and duration of time in the previous week spent walking briskly (''for recreation or exercise or to get to or from places''), in moderate-intensity LTPA (''like golf, social tennis, moderate exercise classes, recreational swimming, line dancing''), and in vigorous-intensity LTPA (''that makes you breathe harder or puff and pant, like aerobics, competitive sport, vigorous cycling, running, swimming''). Women were asked to report only activities lasting at least 10 minutes.

An activity score took into account the differences in energy expenditure of the three types of LTPA. The score was calculated by multiplying minutes in each activity by an assigned metabolic equivalent (MET) value (walking, 3.0 METs; moderate intensity, 4.0 METs; and vigorous intensity, 7.5 METs[22 23]) and summing the products to give a total LTPA score in MET.minutes per week. Responses were then categorised as none (0 to <40), very low (40 to <180), low (180 to <300), moderate (300 to <600), high (600 to <1200) or very high (1200+). The lower cut-off for the high category is equivalent to 150 minutes of moderate-intensity LTPA, the minimum required to meet Australian and US recommendations for health benefits.[24 25] A variable representing MET.minutes per week of walking was computed as the total time spent walking multiplied by 3.0 (METs). Responses were categorised in the same way as for the LTPA score except the very high category was not included because no women reported 1200 or more MET.minutes per week of walking (ie, ⩾400 minutes).

Assessment of confounders

Potential confounders in the relationship between LTPA and arthritis were identified from a review of the literature (listed in table 1). These included area of residence (derived from postal codes); country of birth (as an indicator of race/ethnicity); ability to manage on one's income (as a proxy for income status, assessed as ''impossible or difficult'' or ''not impossible or difficult''); number of chronic conditions (from a list of 15 health conditions, including diabetes, cancer, heart disease and stroke, that women reported they had been told they had by a doctor in the previous 3 years[17]); and depression (''in the last 3 years, have you been told by a doctor that you have depression?''[17]). For alcohol status, respondents were classified as low-risk drinkers (<14 drinks per week or <2 drinks per day), non-drinkers (do not drink alcohol) or high-risk drinkers (⩾15 drinks per week or ⩾3 drinks per day).

Height without shoes and weight without clothes or shoes were reported, and body mass index (BMI) was calculated as kg/m^2. Owing to large numbers of missing data for this variable (10% in 1999; 9% in 2002), missing BMI data from 279 women in 1999 and 509 women in 2002 were imputed from values derived from the preceding and subsequent surveys (ie, from 1999 and 2005 BMI for missing 2002 BMI data). BMI was then categorised in accordance with the World Health Organization classification system.[26]

Statistical analyses

The initial sample included older women aged 73–78 years in 1999 who reported no arthritis and no limitations in their ability to walk 100 metres for the 1999 survey. From that sample, those with missing outcome or predictor variable data were excluded from analysis. Differences between women whose data were included and those whose data were excluded were examined using variables measured in 1999. Pearson's χ^2 test was used for categorical variables, and an independent-samples t test was used for the one continuous variable, age. For the main analyses, Stata 10.0 was used to compute population-averaged binomial general estimating equation (GEE) models. Individuals served as random effects. Predictor variables (LTPA and potential confounders) measured in 1999 and 2002 served as fixed effects in a time-lag analysis, with arthritis measured in 2002 and 2005 serving as the outcome variable. Bootstrapping was used to improve the precision of the estimates. The associations between each predictor variable and arthritis were initially examined in simple models adjusted for area of residence, education and marital status, to account for over-representation in certain categories of these variables. Significant confounders were then included in a fully adjusted model to examine the association between LTPA and

Table 1 Characteristics of a national Australian sample of women, aged 73–78 years in 1999, who reported no arthritis and no limitation to their ability to walk 100 m in 1999

Variables	Women included in the analyses n = 3613	Women excluded from the analyses n = 1814	p Value for differences between included and excluded women
Age in years: mean (SD)	75.28 (1.44)	75.50 (1.47)	<0.001
Education (%)			<0.001
No high school	27.8	38.5	
Some high school	40.0	39.8	
Completed high school	14.4	10.3	
Trade certificate/university degree	17.8	11.5	
Area of residence (%)			0.113
Urban	42.6	40.6	
Large town	12.1	13.9	
Small town/remote area	45.3	45.5	
Country of birth (%)			<0.001
Australia	78.9	77.0	
Other English speaking	14.0	12.7	
Non-English speaking	7.1	10.3	
Income management (%)			0.001
Not impossible or difficult	79.6	74.9	
Impossible or difficult	20.4	25.1	
Marital status (%)			0.008
Married/de facto	53.2	49.9	
Separated/divorced/never married	7.8	6.8	
Widowed	39.0	43.3	
Number of chronic conditions (%)			<0.001
0	39.7	41.6	
1	38.9	34.0	
2	15.8	16.0	
3 or more	5.6	8.4	
Diagnosis of depression (%)			<0.001
No	96.5	92.3	
Yes	3.5	7.7	
Smoking status (%)			0.938
Never	64.7	64.8	
Former	30.1	30.3	
Current	5.2	4.9	
Alcohol use (%)			<0.001
Low risk	64.8	57.3	
Non-drinker	31.1	39.7	
High risk	4.2	3.0	
Body mass index (kg/m^2) (%)			0.149
Healthy weight (18.5 to <25)	54.0	53.3	
Underweight (<18.5)	3.7	5.1	
Overweight (25 to <30)	32.5	31.5	
Obese (≥30)	9.8	10.2	
Leisure-time physical activity (MET.minutes per week*) (%)			<0.001
None (0 to <40)	24.1	33.3	
Very low (40 to <180)	6.9	6.5	
Low (180 to <300)	9.1	8.7	
Moderate (300 to <600)	16.4	14.9	
High (600 to <1200)	18.0	15.3	
Very high (≥1200)	25.5	21.3	

Percentages for a variable do not necessarily sum to 100% due to rounding error.
*MET.minutes were computed as the sum of total leisure-time physical activity (LTPA) minutes after weighting time in each activity by its assigned metabolic equivalent value (walking, 3.0; moderate LTPA, 4.0; vigorous LTPA, 7.5).[22 23]

self-reported arthritis. Among women who reported no moderate or vigorous LTPA in 1999 or in 2002 (ie, reported only walking), the same modelling was used, except walking replaced LTPA as the predictor variable of interest. Odds ratios and 95% confidence intervals were computed for all models.

RESULTS

In 1999, 5703 (57%) of the 10 030 women who completed the survey did not report arthritis. Of these, 276 reported a limited ability to walk 100 metres. Of the remaining 5427 women, 900 were excluded because they had missing outcome data. An additional 914 were excluded because they had missing data for a confounding variable (n = 848), most notably smoking (n = 271), area of residence (n = 194) or BMI (n = 126), or for LTPA (n = 66), leaving data from 3613 women (67% of those eligible) available for analysis.

The main reasons for missing data were incomplete survey completion (44%), no return (19%), withdrawal (15%) and death (12%). Statistically significant differences were found between women whose data were included in the analysis and those whose data were excluded (see table 1). Compared with women whose data were included, those whose data were excluded were more likely to have no high school education ($p<0.001$), be born in a non-English-speaking country ($p<0.001$), find managing on their income difficult or impossible ($p = 0.001$), be widowed ($p = 0.005$), report at least two chronic conditions ($p = 0.010$), have depression ($p<0.001$), be non-drinkers ($p<0.001$), and be less physically active ($p<0.001$).

About one-quarter of the women in the analysis sample reported no LTPA in 1999. Eleven per cent reported participation in moderate- or vigorous-intensity LTPA but not in walking, whereas 41% reported walking but no other moderate- to vigorous-intensity LTPA. The remaining 24% reported both walking and moderate- or vigorous-intensity LTPA.

Twenty-two per cent (n = 757) of the 3390 women who participated in the 2002 survey reported arthritis that year, and 31% (n = 824) of the 2658 women participating in the 2005 survey reported arthritis that year. Half the 2005 cases (53%, n = 439) had not been reported in 2002.

The models computed to examine the association between LTPA and self-reported arthritis are shown in table 2. Only variables that were significant in simple models, and thus included in the full model, are listed. In both models, the odd ratios for self-reported arthritis were lowest for women in the moderate LTPA category. The odds ratios were slightly higher for women in the high and very high LTPA categories, but their confidence intervals were similar to those for the moderate category, suggesting a threshold effect.

The association between walking behaviour and self-reported arthritis was examined next (see table 3). Only women who reported no LTPA other than walking in 1999 and 2002 (n = 2666; 74% of the sample) were included in these analyses. In both the simple and full models, there was an inverse dose–response relationship with the lowest ORs seen for women in the moderate and high walking categories. A full model in which the categorical walking variable was treated as continuous indicated a linear trend in the association between walking and self-reported arthritis ($p<0.001$).

DISCUSSION

This study is among the first to examine the association between LTPA and self-reported arthritis in a population-based

Table 2 Odds ratios for reporting diagnosis with, or treatment for, arthritis in 2002 or 2005, in a national Australian sample of 3613 women, aged 73–78 years in 1999, who reported no arthritis and no limitation to their ability to walk 100 m in 1999: results from general estimating equation analyses

Variables	Simple models* OR (95% CI)	Full model† OR (95% CI)
Age	1.18 (1.15 to 1.20)	1.15 (1.12 to 1.18)
Education		
No high school	1.00	1.00
Some high school	0.88 (0.75 to 1.05)	0.92 (0.77 to 1.10)
Completed high school	0.72 (0.58 to 0.90)	0.78 (0.62 to 0.97)
Trade certificate/university degree	0.84 (0.69 to 1.03)	0.91 (0.74 to 1.13)
Area of residence		
Urban	1.00	1.00
Large town	0.75 (0.60 to 0.93)	0.74 (0.59 to 0.92)
Small town/remote area	0.84 (0.73 to 0.97)	0.83 (0.72 to 0.96)
Income management		
Not impossible or difficult	1.00	
Impossible or difficult	1.30 (1.13 to 1.49)	1.26 (1.10 to 1.44)
Marital status		
Married/de facto	1.00	1.00
Separated/divorced/never married	1.19 (0.93 to 1.52)	1.14 (0.89 to 1.47)
Widowed	1.23 (1.08 to 1.39)	1.07 (0.94 to 1.22)
Number of chronic conditions		
0	1.00	1.00
1	1.42 (1.25 to 1.61)	1.10 (0.96 to 1.26)
2	1.77 (1.52 to 2.06)	1.25 (1.06 to 1.48)
3 or more	2.29 (1.93 to 2.72)	1.40 (1.15 to 1.70)
Diagnosis of depression		
No	1.00	1.00
Yes	1.37 (1.06 to 1.79)	1.22 (0.94 to 1.60)
Smoking status		
Never	1.00	1.00
Former	1.10 (0.96 to 1.27)	1.10 (0.95 to 1.27)
Current	0.58 (0.41 to 0.81)	0.59 (0.42 to 0.85)
Body mass index (kg/m^2)		
Healthy weight (18.5 to <25)	1.00	1.00
Underweight (<18.5)	0.83 (0.58 to 1.19)	0.82 (0.58 to 1.17)
Overweight (25 to <30)	1.33 (1.17 to 1.51)	1.31 (1.15 to 1.49)
Obese (≥30)	1.69 (1.39 to 2.06)	1.54 (1.26 to 1.88)
Leisure-time physical activity (MET.minutes per week‡)		
None (0 to <40)	1.00	1.00
Very low (40 to <180)	0.90 (0.74 to 1.11)	0.96 (0.79 to 1.18)
Low (180 to <300)	0.81 (0.68 to 0.98)	0.88 (0.73 to 1.06)
Moderate (300 to <600)	0.70 (0.59 to 0.82)	0.78 (0.67 to 0.92)
High (600 to <1200)	0.73 (0.62 to 0.85)	0.81 (0.69 to 0.95)
Very high (≥1200)	0.73 (0.62 to 0.85)	0.84 (0.72 to 0.98)

*Separate models were computed for each variable in the table and adjusted for education, area of residence and marital status to account for over-representation of women in certain categories of these variables.
†One model was computed with all variables listed in the table.
‡MET.minutes were computed as the sum of total leisure-time physical activity (LTPA) minutes after weighting time in each activity by its assigned metabolic equivalent value (walking, 3.0; moderate LTPA, 4.0; vigorous LTPA, 7.5).[22 23]

Table 3 Odds ratios for reporting diagnosis with, or treatment for, arthritis in 2002 or 2005, in a national Australian sample of 2666 women, aged 73–78 years in 1999, who reported no arthritis and no limitation to their ability to walk 100 m in 1999 and reported no leisure-time physical activities other than walking in 1999 and 2002: results from general estimating equation analyses

Variables	Simple models* OR (95% CI)	Full model† OR (95% CI)
Age	1.17 (1.14 to 1.20)	1.14 (1.10 to 1.18)
Education		
No high school	1.00	1.00
Some high school	0.88 (0.72 to 1.08)	0.94 (0.76 to 1.16)
Completed high school	0.76 (0.58 to 1.00)	0.84 (0.63 to 1.11)
Trade certificate/university degree	0.85 (0.66 to 1.09)	0.94 (0.72 to 1.22)
Area of residence		
Urban	1.00	1.00
Large town	0.79 (0.61 to 1.02)	0.75 (0.57 to 0.98)
Small town/remote area	0.82 (0.70 to 0.96)	0.80 (0.68 to 0.95)
Income management		
Not impossible or difficult	1.00	
Impossible or difficult	1.30 (1.10 to 1.54)	1.27 (1.07 to 1.50)
Marital status		
Married/de facto	1.00	1.00
Separated/divorced/never married	1.16 (0.86 to 1.57)	1.15 (0.85 to 1.57)
Widowed	1.27 (1.08 to 1.49)	1.12 (0.95 to 1.33)
Number of chronic conditions		
0	1.00	1.00
1	1.39 (1.18 to 1.65)	1.10 (0.92 to 1.32)
2	1.70 (1.40 to 2.07)	1.21 (0.98 to 1.50)
3 or more	2.43 (1.96 to 3.00)	1.51 (1.18 to 1.93)
Diagnosis of depression		
No	1.00	1.00
Yes	1.46 (1.03 to 2.06)	1.26 (0.89 to 1.78)
Smoking status		
Never	1.00	1.00
Former	1.12 (0.94 to 1.34)	1.09 (0.91 to 1.31)
Current	0.50 (0.32 to 0.77)	0.50 (0.32 to 0.79)
Body mass index (kg/m^2)		
Healthy weight (18.5 to <25)	1.00	1.00
Underweight (<18.5)	0.80 (0.52 to 1.23)	0.81 (0.53 to 1.24)
Overweight (25 to <30)	1.33 (1.14 to 1.56)	1.31 (1.11 to 1.54)
Obese (≥30)	1.58 (1.25 to 1.99)	1.41 (1.12 to 1.79)
Walking (MET.minutes per week‡)		
None (0 to <40)	1.00	1.00
Very low (40 to <180)	0.87 (0.71 to 1.07)	0.93 (0.75 to 1.14)
Low (180 to <300)	0.77 (0.64 to 0.94)	0.83 (0.68 to 1.01)
Moderate (300 to <600)	0.67 (0.56 to 0.80)	0.75 (0.63 to 0.90)
High (600 to <1200)	0.62 (0.52 to 0.75)	0.69 (0.57 to 0.83)

*Separate models were computed for each variable in the table and adjusted for education, area of residence and marital status to account for over-representation of women in certain categories of these variables.
†One model was computed with all variables listed in the table.
‡MET.minutes were computed as total walking minutes weighted by the metabolic equivalent value assigned to walking (3.0).[22]

cohort of older women. The results show an inverse association for both LTPA and walking, with a minimum of 75–150 minutes of moderate-intensity LTPA or 100–200 minutes of walking per week, in bouts of at least 10 minutes, associated with decreased reports of arthritis over 6 years, in older women who had not been diagnosed with, or treated for, arthritis in the previous 3 years and were able to walk.

Interestingly, the pattern of the relationship differed between women who reported some moderate and vigorous activities along with walking and women who reported only walking. In the former group, the results suggest a threshold effect with women reporting moderate levels of LTPA, equivalent to 75 to <150 minutes of moderate-intensity LTPA per week, having the lowest ORs for self-reported arthritis. This is less than the 150 minutes per week of moderate-intensity physical activity required to meet general Australian and US physical activity

guidelines.[24 25] Participating in more LTPAs did not appear to offer any additional benefit; indeed, the ORs were slightly higher in women who reported more LTPA. In contrast, among the women who only walked, the ORs for self-reported arthritis were progressively lower across the range of walking categories, up to the high walking category of 200 to <400 minutes per week.

These findings of a protective effect support those of a Cooper Clinic study,[3] in which the researchers found that moderate to high joint stress activities (mostly jogging) reduced the risk of self-reported physician-diagnosed osteoarthritis (OA) in women aged 20–87 years. Our findings do not, however, support those from a number of other studies. For example, in another Cooper Clinic (US) study,[7] the researchers reported no significant association between miles per week spent walking or jogging and self-reported physician-diagnosed OA in older (50–87 years) women. Similarly, in the Alameda County Cohort Study (US), no significant association was found between LTPA and self-reported arthritis among women aged 16–94 years (27% of whom were aged 50+ years at baseline).[8] Also, no association was found between LTPA and self-reported total hip replacement due to OA among women aged 44–69 years in the Nurses Health Study (US).[27]

The differences between our study and these others may reflect the fact that most other studies examined OA specifically, whereas, in the present study, all types of arthritis were included. Although ALSWH women were not asked about type of arthritis in 1999 or 2002, this was asked in 2005. That year, 29% reported OA; 6% reported rheumatoid arthritis; 15% reported "other" arthritis; and the rest reported across these categories. Also, the ages of women in the studies differed, with our study recruiting the narrowest and oldest age range of women. As suggested by others,[7] recruitment of individuals within broad age ranges may explain inconsistencies in results and may suggest the need to analyse associations between LTPA and arthritis by age.

Comparisons among studies of self-reported arthritis are also made difficult by differences in LTPA measures and in duration of follow-up. For example, LTPA has been measured as participation in specific activities, such as walking or jogging;[4 7] in low versus moderate-to-high joint stress activities;[3] and in generic types of activity using responses of "often", "sometimes" or "never".[8] In the present study, we attempted to quantify participation in walking, as well as in other moderate- and vigorous-intensity activities. The use of six categories for LTPA enabled us to assess the impact of activity at levels lower than those required to meet national guidelines in Australia and the USA. This is important because there is growing evidence that some activity is better than none in terms of the development of a number of health outcomes, including cardiovascular disease and diabetes, in older women.[28] There is also increasing evidence in support of the view that walking can prevent the onset of chronic health problems in older women.[28]

A strength of this study was the use of a national sample of women, as most previous epidemiologic studies of arthritis risk factors have been in defined[3 7 27] or regional populations.[4–6 8] Furthermore, the women were over 70 years of age; therefore, we studied a population that has an increased risk of arthritis and is becoming an ever-larger proportion of the general population as the population ages. In previous studies, typically few of the women recruited were in this older age range.

Study limitations

This study relied on self-reported data. Although self-reported arthritis lacks the validity of objective measures, it has been associated with decreased ability to conduct functional tasks and with disability.[29] Also, evidence from previous studies suggests that people under-report confirmed diagnosis of arthritis,[7 30] so that our estimates of arthritis may be low. Indeed, the prevalence of arthritis among ALSWH older women between 1999 and 2005 was 42%, lower than the national prevalence[31] of 49% for older women.

Another limitation is that the follow-up period was short, 6 years, and arthritis can take decades to develop. With the women already in their seventies at baseline, those who reported diagnosis of, or treatment for, arthritis at a follow-up probably had developed arthritis much earlier but had recently developed pain or functional limitations that convinced them to finally seek care. Therefore, our arthritis items likely measured incident onset of pain or function limitations that encouraged women to seek care rather than incident arthritis. Our findings thus add to previous findings indicating that physical activity is protective against functional decline among adults with arthritis,[32] which is important for keeping older women independent.

Another limitation was that it was not possible to examine associations separately by type of arthritis, given the single-item arthritis question used in 1999 and 2002. However, some information about types was available in 2005, allowing for some understanding of the types of arthritis reported. It should also be noted that there is strong evidence suggesting that previous joint injury is an important risk factor for osteoarthritis,[33 34] but data on injuries were not collected for ALSWH. Therefore, the analyses could not assess confounding effects of prior injury. Our findings are also limited by the potential effect of attrition. Although ALSWH included a fairly representative national sample of older women at the first data collection point in 1996,[15] as with all prospective studies, there has been continual attrition over time, with more healthy women remaining in the cohort.[16] The findings cannot, therefore, be generalized to all women in their seventies. Selection bias was also introduced by excluding women reporting arthritis in 1999. Older women who had engaged in LTPA over many years prior to 1999 may have developed arthritis before the start of our study.

CONCLUSIONS AND IMPLICATIONS

This study found an inverse association between LTPA and self-reported arthritis over 6 years among older women in their seventies. The greatest risk reduction was in women who reported 75 to <150 minutes of moderate-intensity LTPA per week. Among older women who reported only walking as their LTPA, there was an inverse dose–response relationship, with walking as little as 100–200 minutes per week showing a beneficial effect. These findings suggest that walking as the only form of activity, or in conjunction with other moderate- to vigorous-intensity activities, may have a role in the primary prevention of self-reported arthritis in older women who have not recently been diagnosed with, or treated for, arthritis and are able to walk.

What is already known on this subject

The risk of arthritis is high in women. With the ageing of Western populations, the prevalence of arthritis is increasing. There is conflicting evidence about the role of leisure-time physical activity in the prevention of arthritis in older women.

What this study adds

For women in their seventies who have not yet been diagnosed with, or treated for, arthritis and who are able to walk, 75+ minutes of moderate-intensity leisure-time physical activity or 100+ minutes of walking each week may reduce reports of arthritis treatment or diagnosis over 6 years.

Policy implications

The results suggest that older women who are able to walk should be encouraged to engage in walking or other moderate-intensity physical activities to decrease the initial need to seek treatment for arthritis. These findings should be confirmed with objective measures of arthritis status.

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